Test 1, Fall 95.
Math 4317, October 16 95.

W. Gangbo *

September 14, 2009

Name:

Instructions. You are to work independently these exercises for the next fourty five minutes (45 mn.), but may use your class notes. Read carefully each exercise and show all your work.

Exercise 1 (1 point) Presentation

*School of Mathematics, Georgia Institute of technology.
Exercise 2 (2 points)
Does it exist a rational number $t$ such that $t^2 = \frac{3}{2}$? Justify your answer.
Exercise 3 (2 points)
(a) Let $x \in \mathbb{R}$ be such that $x \neq 1$ and let $n \in \mathbb{N}$. Prove that

$$1 + x \cdots + x^n = \frac{1 - x^{n+1}}{1 - x}.$$

(b) Prove that for all $n \in \mathbb{N}$,

$$1 + \frac{1}{2} + \frac{1}{2^2} + \cdots + \frac{1}{2^n} < 2.$$
Exercise 4 (3 points)
Determine the set of real numbers $x$ satisfying the inequality

$$\frac{x}{x+1} \geq \frac{x}{3x+2}.$$
Exercise 5 (1 point)
Is there any finite subset $B \subset \mathbb{N}$ such that

$$(0,1) = \bigcup_{n \in B} \left( \frac{1}{n}, 1 \right)?$$

Justify your answer.
Exercise 6 (1 point)
Is the cantor set constructed in class closed? Justify your answer.